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## ABSTRACT

This paper defines contrastive phonetics and discusses phonetic work in the Jyvaskyla Contrastive Project, the background theory of contrastive analysis, and expansion of the framework of contrastive phonetics. Contrastive phonetics is defined as a method which is used to compare the similarities and differences in the chain of speech communication between two languages, (i.e., similarities and differences in the phonetic processes taking place in the production and perception of speech). It is claimed that traditional contrastive phonology is insufficient to explain many of the difficulties that are met by foreign language students as a result of interference in the phonetic processing of speech. Traditional contrastive analysis must be supplemented by an analysis of the phonetic structures in the native and target language and in the approximative systems of foreign language students. The method of contrastive phonetics involves an empirical analysis of the entire chain of speech communication as employed by speakers of both languages as well as an analysis of the interlanguage--from the viewpoint of both the sender and the receiver of the linguistic message. Experiments with native speakers of English and Finnish speakers of English are reported. (SW)

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## THEORY AND METHODS OF CONTRASTIVE PHONETICS

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### 1. DEFINING CONTRASTIVE PHONETICS

In this paper contrastive phonetics will be defined as a method which is used to compare the similarities and differences in the chain of speech communication between two languages, ie. similarities and differences in the phonetic processes taking place in the production and perception of speech. It will be claimed that traditional contrastive phonology is insufficient to explain many of the difficulties which are met by FL students as a result of interference in the phonetic processing of speech. Therefore, traditional contrastive analysis must be supplemented by an analysis of the phonetic structures in the native and target language and in the 'approximative' systems of FL students.

The method of contrastive phonetics involves an empirical analysis of the entire chain of speech communication as employed by speakers of both languages as well as an analysis of the interlanguage - from the viewpoint of both the sender and the receiver of the linguistic message. An integral part of the procedure of such an analysis is what could be called 'error analysis', ie. tests used to find out how students perceive, in terms of linguistic categories, utterances produced by native speakers and how native speakers evaluate utterances produced by foreign language students. What are traditionally called 'pronunciation errors' are not as such objects of such tests; the results obtained are not considered 'errors' in the classroom sense of the word.

The similarities and differences between the communication chains consist of two kinds of factors: similarities and differences in the way in which linguistic information is turned into physical speech, and those in the way in which the characteristics of physical speech are processed

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in reception. The research carried out so far has indicated that many of the problems in the production and reception of speech are basically due to the system which exists between the conscious phonological level and concrete physical speech, and which is unconscious for the most part.

The problem of equivalence is central to phonetic studies. Only seldom is the problem so simple that it can be solved by simply comparing the 'same' sounds in the two languages. The elements confused with each other may be quite unexpected. For instance, a Finn may meet difficulties in learning the fortis/lenis distinction of English consonants as a result of the long/short distinction of Finnish vowels; what a Finn regards as clarity in his pronunciation of English may be regarded as foreign accent and lack of fluency by a native speaker; errors in the pronunciation of certain sounds may be heard as changes in the stress pattern of the words, and so on. In most cases, traditional contrastive analysis has been insufficient to give explanations to such crosslanguage interference.

Differences in the way in which two languages signal higher-level information such as morphological and syntactic patterns, lexical units or even textual features such as topicalization can also result in interference in speech communication. For instance, the process of how a lexical word is detected in English may be somewhat different from that used in Finnish as a consequence of linguistic differences of the type discussed by Karlsson (1977), although it is not possible to verify this hypothesis by methods available at present. When the hypothesis is verified, however, we will have revealed an essential source of difficulty for a Finn in the comprehension of spoken English (cf. Ringbom 1976:3). This piece of information may also be of considerable importance for attempts to find a way of teaching learners to overcome difficulties which are due to this higher-level interference phenomenon of phonetic processing.

## 2. ON PHONETIC WORK IN THE JYVÄSKYLÄ CONTRASTIVE PROJECT

Most of the earlier phonetic and phonological studies of the Jyväskylä contrastive project start from a threefold set-up: when the errors made by a foreign language learner in speech are analysed and the sources of such errors are investigated, it is necessary (1) to analyse the phonetic

and perceptual parameters of the L2 phenomenon; (2) to determine the way in which the learner's production differs from the target, ie. from the corresponding production of the native speaker, and the way in which the language learner's perception and the correlates (phonetic cues) which he employs to reach that perception differ from those of the native speaker; and (3) to study the phenomena in the learner's L1 which cause such divergencies. What is studied, therefore, is not only 'pronunciation' but a complex of problems which extend far beyond the area of traditional pronunciation teaching, that is, the differences in the learner's L1 and L2 communication chains as a whole and the problems and confusions arising from the fact that the learner unconsciously resorts to L1 phenomena not only when producing L2 but also when trying to understand L2.

In addition to native speakers, three groups of Finnish speakers of English are used as subjects for experiments: university students who are not majoring in English but who represent the product of English language teaching in Finnish secondary schools; university students who have reached the qualifications of the teacher of English; and, in some of the studies, students of Finnish comprehensive schools (from 9 to 16 years of age) who are taught English.

The majority of the phonetic studies are limited to certain specific phonetic phenomena such as the fortis/lenis distinction in English, which has been divided into several separate studies, English vowel reduction, production and perception of English word stress, consonant clusters at word boundaries, errors in the signalling of English word boundaries, sentence stress and sentence rhythm, fluency, juncture and hesitation pauses, acceptability of the Finnish variety of the pronunciation of English and the reliability and validity of the marking of pronunciation errors, various methodological problems in the research concerned with phonetic skills, and problems connected with oral reading.

Reports have so far been published on testing Finnish schoolchildren's learning of English consonants (Moisio and Valento 1976), English stops as produced by native and Finnish speakers (Suomi 1976), signalling of morphophonological boundaries by Finnish speakers of English (Lehtonen and Koponen 1977), and certain problems of fluency (Sajavaara and Lehtonen 1978; Lehtonen 1978). In addition, certain problems of methodology and objectives have been discussed by Lehtonen (1977).

The more theoretical problems connected with the concepts of co-articulation and vowel reduction are dealt with in the work of Heikkinen (1979). Moisio and Valento (1976) test certain problems in Finnish schoolchildren's consonants on a rather traditional basis, while Suomi (1976) represents an approach where, in addition to the structural differences in the phonological systems of the two languages, concrete speech is analysed instrumentally as well. His report is only the first part of a larger programme concerned with the fortis/lenis opposition. Sajavaara and Lehtonen (1978) and Lehtonen (1978) are preliminary reports on the research centred round the problem of how fluency should and could be measured.

Moisio and Valento (1976) show in their work that the classical sound discrimination test has little relevance as regards the testing of foreign language skills.<sup>1</sup> In the tests the control group children, who studied German as a foreign language and who had never in their life studied English, achieved higher scores in the English discrimination tests than the children three years younger who had studied English.

The work by Suomi (1976) is one of three separate studies, all of which have been carried out on a parallel basis. One of them is concerned with the problems of the English fortis/lenis distinction as a whole, one with the specific problems involved in the production of plosives, and one with the difficulties in the production of English consonants at the secondary level.

The problems which a Finn meets when learning the entire fortis/lenis opposition of English consonants are discussed by Hänninen (1979). In this study the opposition has been analysed in three different contextual environments: in isolated words, in words included in word lists, and in words embedded in meaningful sentences (eg. *The old man's decease/disease made everybody sad; He used to write/ride when he was young*). In the English fortis/lenis opposition the timing of the consonant itself, and that of the neighbouring segment, seem to be the greatest problems for a Finn: "It can be said without doubt that the Finnish group have here undergone a complete failure: in fact they have not succeeded in making any fortis/lenis distinction at all" (Hänninen 1979). All the parameters that are used to maintain the distinction are either lacking in the production of Finns, or are opposite to those used as identification cues by native speakers.

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<sup>1</sup> This view will be confirmed in the forthcoming work by Lamminmäki (1979). 5

The hypothesis that erroneous pronunciation is only a reflection of the problems involved in the perception of foreign speech was examined by means of several identification tests. There were three different settings: (1) Finnish students identified words or sentences produced by native speakers of English; (2) Finnish students of English identified native stimuli; and (3) native speakers of English identified isolated words or sentences produced by Finnish students. The results of the tests are revealing: the Finnish students failed to identify most of the oppositions tested, and the English listeners, even though they were all lecturers at a Finnish university, were seldom able to identify correctly the English words pronounced by the students in either informant group. Thus the test shows clearly that the pronunciation problems may have consequences which are more serious than simply a foreign accent in the speech of the Finnish student: they can be a severe communicative impediment, which may affect the listener's semantic interpretation of the message.

The results available at present have also been applied for language teaching purposes by Lehtonen, Sajavaara and May (1977). The textbook resembles, in some parts, traditional textbooks of phonetics but certain new ideas were also adopted. Spoken language is not seen as 'pronunciation', where the important elements to be taught are features like aspiration and position of the tongue, but as interpersonal communication and behavior, where even 'wrong' pronunciation may be acceptable in certain contexts. The book will be supplemented by another volume which will consist of both written materials and audio, possibly even video, cassettes.

### 3. THE BACKGROUND THEORY

One of the crucial questions in the discussion about contrastive analysis has been the choice of the reference model: should CA be based on traditional structural, or generative grammar, and if so, which variety? The practical choice in contrastive field-work is often eclectic: such grammatical theories are applied as seem to give the best explanation in each problem. The alternative is that similarities and differences as

well as interference phenomena between the two systems are described within the framework of a given theory of grammar irrespective of how practical or effective the theory concerned is in explaining each aspect in the complex of problems.

However, the choice of the reference model does not concern only the model to be used in the description of grammar. It should also comprise the choice between a static and dynamic view of language or, in other words, the choice between a linguistic and a psycholinguistic description, or between a structural and operational modelling of the communicative vehicle, ie. language. The former (the structural model) aims at describing the abstracted and idealized structure of language, which, in the case of CA, means similarities and differences in the structures, or grammars, of two or more languages. Independently of the choice of the linguistic model, taxonomic or generative, the objective of such description is always the structure of the language instead of the actual processes.

The target of an operational model of language is not an abstracted static structure but language in action. This does not involve pragmatics or description of linguistic interaction only, but it also means that besides the grammatical structures certain processes are taken into consideration, and, to study these processes, the analyst makes use of disciplines such as cognitive psychology, neurophysiology, theories of information processing, and the progress in automatic processing of speech.

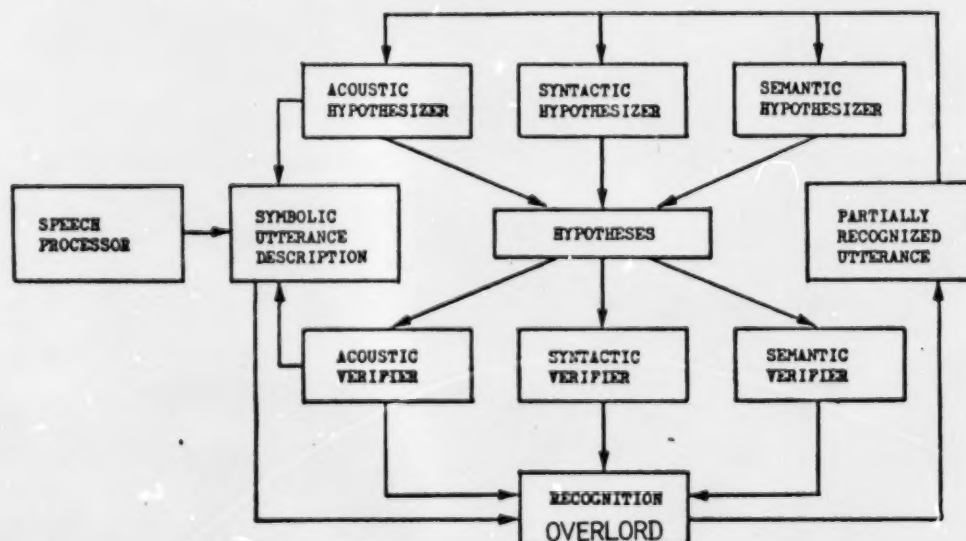


Figure 1. A 'heterarchical' model of a speech understanding system (Ainsworth 1976).

One of the alternatives for a model of the speech understanding process is illustrated in Figure 1. This model is not, however, an actual representation of the real human information-processing system; it is derived from a work on automatic speech understanding (Ainsworth 1976:118). It includes, however, most of the features which typify recent psycholinguistic models. Special attention should be paid to the fact that in this model linguistic information is not processed in a linear way or 'hierarchically' proceeding step by step through the 'levels' of grammar from a more concrete level of representation to phonology and syntax, and to abstract 'meaning'. Instead, the components of the system which exploit the hearer's phonological, syntactic, and pragmatic knowledge are supposed to work simultaneously or according to some kind of time sharing system; active guesses are made and probabilities for each hypothesis are weighed. This model also implies that there are 'cues' for all levels of grammar in the flow of speech waves and the grammatical and semantic information involved is not present in the actual speech coded through phonology alone.<sup>1</sup>

#### 4. EXPANDING THE FRAMEWORK OF CONTRASTIVE PHONETICS

The fundamental role of a human language is to function as a means of communication in human interaction. Therefore, the task of CA cannot be a mere parallel description of two grammatical structures; it should also involve the description of the chains of communication in the two languages. This means that the analyst must, in addition to the description of the grammatical structures, make an attempt to map the differences and similarities in the processes which take place in the speaker and in the listener during speech communication.

Language is used by individuals for definite purposes, and its use is related to the speaker's intentions in some specific time and environment. Moreover, the use of language always makes part of human interaction. These aspects of language, as reflected in the similarities and differences in interactional discourse, must also be included in CA.

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<sup>1</sup> For a further discussion of the models, see Lehtonen 1978b.

In future work, traditional CA will be superseded by research at two levels: (1) Study of differences in the information-bearing features of the acoustic speech signal, differences in the cues of perception, and sources in the perceptual patterning of speech and foreign accent from the viewpoint of the foreign speaker-hearer and the native speaker, and (2) CA of linguistic interaction, which will cover the discourse behavior of native and non-native speakers, including features such as tempo, pauses, paralinguistic and kinetic elements, and various pragmatic, structural and semantic paradigms in their communicative function within discourse. The Finnish-English Contrastive Project has entered a phase where a language user's communicative competence as a whole is the object of study. Attention is paid to all linguistic, psychological and sociological parameters that, together, make it possible for human beings to communicate with each other.<sup>1</sup>

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<sup>1</sup> For further information, see the report "Expanding the Contrastive Analysis Framework" by Sajavaara in this volume.

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